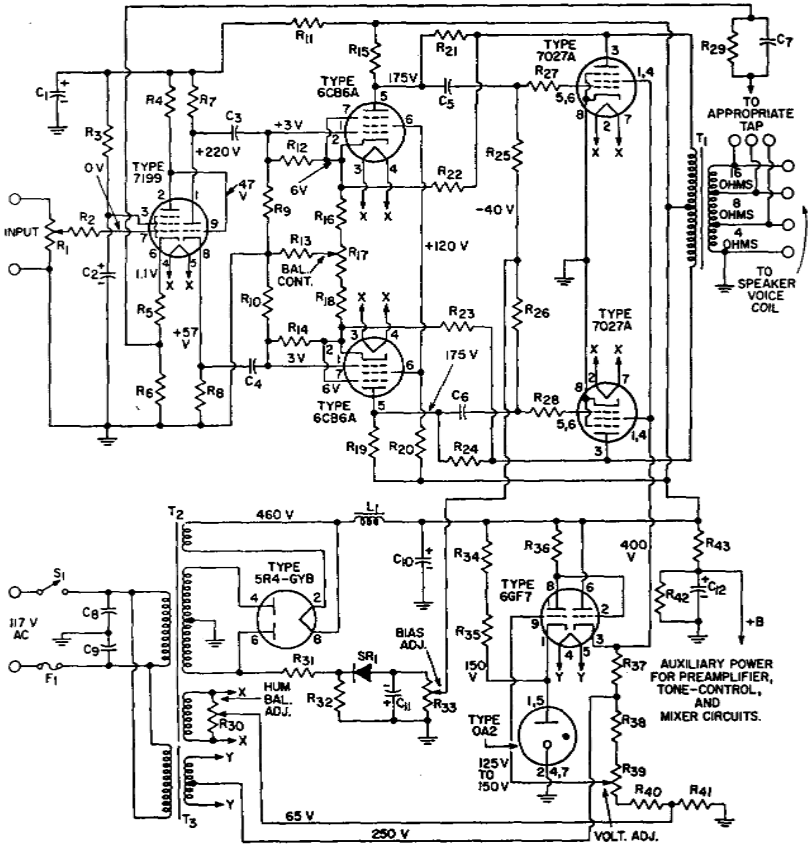
## 29-10 HIGH-FIDELITY AUDIO AMPLIFIER (Cont'd)

### Circuit Description (Cont'd)

fier (circuit 29-9) except that it uses 7868 beam power tubes in the output stage to develop the higher audio power output and uses a resistive network in the negative leg of the power supply, rather than a separate rectifier, to supply the fixed-bias voltage for the output stage. A potentiometer ($R_{19}$) connected across the 6.3-volt heater winding also provides the hum balance adjustment for the 30-watt amplifier.

## 29-11 HIGH-FIDELITY AUDIO AMPLIFIER

Class $AB_1$; Power Output, 50 Watts




### Preliminary Adjustments

The following adjustments should be made *before operation*:

(1) With rectifier out of socket, adjust Bias Adj. $R_{33}$ for −40 volts between the wiper arm and ground bus.
(2) With speaker connected, adjust Screen-Grid Voltage Adj. $R_{38}$ for 400 volts between pin 3 of 6GF7 and ground bus.
(3) With input shorted, adjust Hum Bal. Adj. $R_{30}$ for minimum hum from speaker.
(4) With input open and Vol. Cont. set for maximum volume, adjust Bal. Cont. $R_{17}$ for minimum hum from speaker.

## 29-11 HIGH-FIDELITY AUDIO AMPLIFIER (Cont'd)

### Parts List

$C_1$, $C_2$=40 μF, electrolytic, 450 V
$C_3$, $C_4$=0.02 μF, paper, 400 V
$C_5$, $C_6$=1 μF, paper, 400 V
$C_7$=0.002 μF to 4-ohm tap; 0.0015 μF to 8-ohm tap; or, 0.001 μF to 16-ohm tap; paper, 400 V
$C_8$, $C_9$=0.05 μF, paper, 600 V
$C_{10}$=20 μF, electrolytic, 450 V
$C_{11}$=100 μF, electrolytic, 150 V
$C_{12}$=40 μF, electrolytic, 450 V
$F_1$=Fuse, 5 amperes
$L_1$=Choke, 8 H, 250 mA, dc resistance 60 ohms, or less
$R_1$=Volume control, potentiometer, 0.5 megohm
$R_2$=4700 ohms, 0.5 watt
$R_3$=0.82 megohm, 0.5 watt
$R_4$=0.22 megohm, 0.5 watt
$R_5$=820 ohms, 0.5 watt
$R_6$=10 ohms, 0.5 watt
$R_7$ $R_8$= 15000 ohms, 2 watts
$R_9$, $R_{10}$=1.5 megohms, 0.5 watt
$R_{11}$=33000 ohms, 2 watts
$R_{12}$, $R_{14}$=1.3 megohms, 0.5 watt
$R_{13}$=47 ohms, 0.5 watt
$R_{15}$, $R_{19}$=0.15 megohm, 0.5 watt
$R_{16}$, $R_{18}$=390 ohms, 0.5 watt
$R_{17}$=AC balance control, potentiometer, 500 ohms
$R_{20}$=0.15 megohm, 1 watt
$R_{21}$, $R_{24}$=0.33 megohm, 1 watt
$R_{22}$, $R_{23}$=0.12 megohm, 2 watts
$R_{25}$, $R_{26}$=0.1 megohm, 0.5 watt
$R_{27}$, $R_{28}$=4700 ohms, 0.5 watt
$R_{29}$=600 ohms to 4-ohm tap; 820 ohms to 8-ohm tap; or, 1200 ohms to 16-ohm tap; 0.5 watt
$R_{30}$=Hum balance adjustment, potentiometer, 100 ohms
$R_{31}$=0.12 megohm, 5 watts
$R_{32}$, $R_{34}$, $R_{35}$, $R_{37}$=33000 ohms, 2 watts
$R_{33}$=Bias adjustment, potentiometer 50000 ohms,
$R_{36}$=0.27 megohm, 0.5 watt
$R_{38}$=10000 ohms, 1 watt
$R_{39}$=Screen-grid voltage adjustment, potentiometer, 25000 ohms, 2 watts
$R_{40}$=15000 ohms, 2 watts
$R_{41}$=12000 ohms, 2 watts
$R_{42}$=0.22 megohm, 2 watts
$R_{43}$=22000 ohms, 2 watts
$SR_1$=Selenium rectifier, 20 mA, 135 volts rms
$T_1$=Output transformer for matching impedance of voice coil to 5000-ohm plate-to-plate tube load; 50 watts; frequency response, 10 to 50000 Hz; United Transformer Corp. LS6L4 or equiv. (see Note 1)
$T_2$=Power transformer, 600-0-600 volts rms, 200 mA, 6.3 V., 5 A; 5 V., 3 A; Thordarson 22R36 or equiv. (see Note 2)
$T_3$=Filament transformer, 6.3 volts, center tapped, 1 ampere; Thordarson 21F08 or equiv.

**Notes:** 1. In many applications, less expensive transformers, such as Stancor Type A8053 or United Transformer Corporation Type S-17, which have a narrower frequency response, may be used for $T_1$ with satisfactory results.
2. For stereo operation from a single power supply, the following changes are required: (a) The power transformer $T_2$ must be replaced by one that has a higher current rating; a Freed Transformer Corporation Type DC6A or equivalent (600-0-600 volts rms, 300 mA) is recommended. (b) The 50000-ohm Bias Adj. potentiometer $R_{33}$ should be replaced by two 100000-ohm potentiometers (one for each channel) connected in parallel. (c) A second 5R4-GYB rectifier tube should be connected in parallel with the one used for monaural operation. (Connect the 5R4-GYB tubes so that the two sections of each tube are in parallel with the corresponding sections of the other tube; do not use separate tubes for each section of the rectifier circuit.)
3. If the amplifier oscillates or "motorboats," reverse ground and feedback connections in secondary of output transformer $T_1$.

### Circuit Description

This four-stage audio power amplifier can deliver 50 watts of rms power output with less than 0.1 per cent total harmonic distortion and less than 1 per cent intermodulation distortion. The frequency response of the amplifier is flat within ±0.5 dB from 10 Hz to 50 kHz. Sensitivity is 0.4 volt rms input for 50 watts output. The total hum and noise is 70 dB below 50 watts.

The 50-watt amplifier, like the 15-watt and 30-watt high-fidelity amplifiers (circuits 29-9 and 29-10), uses a 7199 low-noise triode-pentode as an input amplifier and phase-splitter, but has a push-pull driver stage, which uses 6CB6 sharp-cutoff pentodes. The superior performance of this amplifier can also be attributed, in part, to the use of a 450-volt plate supply and a 400-volt electronically regulated grid-No. 2 supply for the 7027A beam power tubes in the output stage and to the use of inverse-feedback loops from the plates to the grids of the output tubes, from the plates of the output tubes to the cathodes of the driver tubes, and from the voice-coil winding of the output transformer to the cathode of the input amplifier. Additional features are the operation of all heaters at a positive voltage with respect to ground and use of a balancing adjustment ($R_{30}$) in the heater-supply circuit to minimize hum, a grid-No. 2 voltage adjustment ($R_{39}$), a grid-No. 1 bias adjustment ($R_{33}$) for the 7027A output tubes, and an ac-balance adjustment ($R_{13}$) which may be used to balance the outputs of the push-pull stages. Operation of the 50-watt amplifier is essentially the same as that of the 15- and 30-watt amplifiers.